Health Psychology Review
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/rhpr20

Theories and techniques of behaviour change: Developing a cumulative science of behaviour change

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Version of record first published: 15 Feb 2012.

To cite this article: Susan Michie & Marie Johnston (2012): Theories and techniques of behaviour change: Developing a cumulative science of behaviour change, Health Psychology Review, 6:1, 1-6

To link to this article: http://dx.doi.org/10.1080/17437199.2012.654964

Health Psychology Review
Vol. 6, No. 1, March 2012, 1–6

EDITORIAL

Theories and techniques of behaviour change: Developing a cumulative science of behaviour change

As behaviour contributes to the cause of much current mortality and morbidity (Mokdad, Marks, Stroup, & Gerberding, 2000; Parkin, Boyd, & Walker, 2011), interventions to change behaviour are essential in prevention. Behaviour change interventions are usually complex, comprising many interacting components (Craig et al., 2008). The current issue of *Health Psychology Review* provides examples of behaviour change interventions that are effective. However, their effectiveness is variable, and we do not have a full understanding of what accounts for this variability. Evidence about effectiveness, sources of variation and mechanisms of action are accumulating slowly. Ineffective techniques continue to be used, while effective techniques are underused, difficult to replicate and their mechanisms of action are poorly understood.

What is to be done to improve this situation? We suggest three main areas in which conceptual and methodological advances are urgently needed to enhance scientific standards in this area: (1) clarity about 'behaviour' as an outcome, (2) replicable methods for reporting the 'active ingredients', that is behaviour change techniques (BCTs) and (3) linking behavioural interventions and BCTs to theoretical mechanisms of change.

Behaviour is the outcome of behaviour change interventions

Basic psychological research over the last century has demonstrated that behaviour and behaviour change follow predictable patterns. It is therefore vital that interventions are guided by this accumulated science. The 'Decade of Behavior' (2000–2010) (http://www.decadeofbehavior.org) emphasised the importance of behaviour in health and the relevance of research on behaviour to policy objectives. Nevertheless, opportunities may be missed because 'behaviour' may be given a variety of different labels, such as 'adherence', 'physical activity', etc. (Johnston & Dixon, 2008; Marteau & Johnston, 1987) or conceptualised too vaguely (Michie & Johnston, 2004); for example, the significance of precise specification of behaviours is illustrated by McEachan, Conner, Taylor and Lawton's (2011) finding that the Theory of Planned Behaviour may be more effective in predicting some behaviours than others. As a result, the best theory and methods for investigating behaviour may be overlooked.

The importance of defining behaviour as the end-point of a ***behavioural*** intervention cannot be overstated. Very often, the end-point is a consequence of the behaviour, not behaviour itself (e.g. weight, blood glucose level), and the evidence of effectiveness of interventions depends on which type of outcome is specified

ISSN 1743-7199 print/ISSN 1743-7202 online

http://dx.doi.org/10.1080/17437199.2012.654964
http://www.tandfonline.com

(Dombrowski, Sniehotta, Avenell, MacLennon, & Araùjo-Soares, 2012). The problem with evaluating intervention effectiveness in terms of outcomes further down the causal chain (Hardeman et al., 2005) is that there are a host of influences that could intervene and attenuate the link between behaviour and outcome. As Di Matteo, Haskard-Zolnierek and Martin (2012) point out, the correlation between the behaviours involved in medication adherence and health outcomes may vary with the disease condition and the appropriateness and efficacy of the treatment prescribed. Thus, the link between an effective change in behaviour and an effect on a non-behavioural health outcome depends on the strength of the causal relationships established by epidemiology and medical, rather than behavioural, sciences.

For some interventions, behaviour per se is the valued health outcome, for example, in studies to reduce activity limitations or enhance participation (Johnston, Bonetti, & Pollard, 2002). However, when the outcome is behaviour, end-points that are early in the causal chain, such as knowledge and attitudes, are insufficient, as even a strong effect on these cognitive outcomes will be attenuated as they are mediated through motivational and action-oriented processes to result in behaviour (Sniehotta, 2009; Webb & Sheeran, 2006).

In addition, behaviour, itself, needs defining. One definition comes from a multidisciplinary consensus study of theories of behaviour change: 'Anything a person does in response to internal or external events. Actions may be overt (motor or verbal) and directly measurable, or covert (e.g. physiological responses) and only indirectly measurable; behaviours are physical events that occur in the body and are controlled by the brain' (Hobbs, Campbell, Hildon, & Michie, 2011). Behaviour may refer to simple, specific actions, for example, swallowing a pill; in relation to health, it is generally used to refer to more complex sequences of actions. Behaviour may involve the performance of a complex sequence of actions over time; for example, Di Matteo and colleagues identify a sequence of at least four behaviours necessary to adhere to medication advice. The processes involved and the BCTs required for behaviour change may differ for each behaviour in the sequence.

Behaviour change techniques

To develop our scientific understanding of the principles of behaviour change, we need clear and agreed standards for identifying the 'active ingredients' and for designing, evaluating and reporting interventions. The scientific standards demanded, and found to be successful, for biomedical interventions are often ignored when the intervention involves behaviour change. For example, pharmacological interventions require clear specification of the chemical formula of its active ingredients and a high level of competence in the personnel prescribing them, whilst behaviour change interventions are often poorly specified, preventing high-fidelity replication and, despite being complex, delivered by individuals of unreported competence. Even apparently well-described methods such as cognitive behaviour therapy for pain have not been adequately described: 'the usage of the term cognitive behavior therapy varies widely and may include self-instructions … relaxation or biofeedback, development of coping strategies … goal setting' (Gatchel, Peng, Peters, Fuchs, & Turk, 2007, p. 606). Precise specification and descriptions are required: of the behaviours to be changed, the BCTs to be used, the competences

required to deliver them, (e.g. the competences of medical or health psychology training or specific health behaviour change competencies (Dixon & Johnston, 2011; Michie, Churchill, & West, 2011), their modes of delivery (e.g. leaflet, telephone, group; in hospital, at home, in community setting; weekly, one-off, for one hour or one day) and the level of intervention (Michie, van Stralen, & West, 2011). This precision allows one to establish whether, and how, BCTs have been applied to change a particular behaviour and are important in evaluating efficacy, especially in systematic reviews (Dombrowski et al., 2012; Taylor, Conner, & Lawton, 2012; Thoolen, de Ridder, & van Lensvelt-Mulders, 2012). Precise specification of BCTs may also enhance the intervention: Taylor et al.'s (2012) meta-analysis found that when BCTs were not specified, intervention effects were smaller.

BCTs are observable and replicable components of behaviour change interventions. They are the smallest component compatible with retaining the postulated active ingredients, that is, the proposed mechanisms of change, and can be used alone or in combination with other BCTs (Michie, Abraham, et al., 2011; Michie & Johnston, in press). Conceptualising interventions in terms of their component techniques enables the possibility of identifying the 'active ingredients' within interventions. For example, using a reliable BCT coding scheme, Dombrowski et al. (2012) found that instruction, self-monitoring and practice were effective techniques.

Specification also enables a further step underpinning scientific investigation, systematic classification. Both Taylor et al. (2012) and Dombrowski et al. (2012) used a reliable BCT coding scheme to identify BCTs in heterogeneous complex interventions and evaluated their effectiveness using multivariate statistical analyses. Several behaviour-specific classifications of BCTs have been developed in recent years in relation to different behaviour types: physical activity and healthy eating (Abraham & Michie, 2008; Michie, Ashford, et al., 2011), smoking (Michie, Hyder, Walia, & West, 2011; West, Evans, & Michie, 2011), excessive alcohol use (Michie, Whittington, Hamoudi, Zarnani, Tober, & West, in press) and condom use (Abraham, Good, Warren, Huedo-Medina, & Johnson, 2011). These have been constructed by identifying BCTs within written reports of the interventions, or texts describing interventions, in a bottom-up, inductive fashion. To date, their hierarchical structures have not been investigated. This is the next step for taxonomy development, and Stavri and Michie's (2012) article in this issue reviews a variety of classification schemes developed for the natural sciences, such as the Periodic Table of chemical elements and Linnaeus's biological classification system. They identified six distinct types of classification system – nomenclatures, ordered sets, hierarchical, matrices, faceted and social categorisations – and considered their usefulness in relation to behavioural science. The further development of BCT specification and classification is being taken forward using consensus methods on an international basis (Michie, Abraham, et al., 2011; http://www.ucl.ac.uk/health-psychology/BCTtaxonomy).

Linking BCTs with theoretical mechanisms of change

Two of the articles in this themed issue used BCT taxonomies and meta-regression to investigate the association between theoretically coherent combinations of BCTs and intervention efficacy. Both Dombrowski et al. (2012) and Taylor et al. (2012) found that the number of BCTs used did not predict efficacy but having a theoretical basis

for the intervention did. Dombrowski et al. also investigated whether interventions that comprised BCTs that were predicted by theory to work synergistically were more effective than those that did not; interventions including more BCTs that were congruent with Control Theory (Carver & Scheier, 1982) were associated with greater weight loss (in this case, a proxy for healthy eating) in obese adult patients, replicating a similar finding by Michie, Abraham, et al. (2009) in the general adult population. Taylor et al. also found that the extent to which worksite physical activity interventions were explicitly based on theory (using Michie & Prestwich's (2010) theory coding scheme) predicted their effectiveness, a finding consistent with a similar analysis of internet interventions (Webb, Joseph, Yardley, & Michie, 2010).

Ideally, theories summarise the state of cumulative knowledge. They specify key constructs and relationships and the underlying scientific explanations of the processes of change and link behaviour change to constructs in a systematic way. They describe how, when and why change occurs. They allow investigators to understand why and how interventions succeed or fail. Rigorous testing of theoretical principles forms a basis for future interventions. Thus, theories are fundamental in designing behaviour change interventions.

Key frameworks for designing and evaluating behaviour change interventions (Collins et al., 2011; Craig et al., 2008) emphasise the importance of using theory to inform intervention design as well as specifying interventions in terms of component BCTs. However, they do not offer guidance as to how to link the postulated theoretical mechanisms of change with BCTs. This link is necessary both to theoretically inform intervention development and to test theory by evaluating interventions. A preliminary attempt at linking BCTs with theoretical constructs hints at the potential usefulness of such a scheme (Michie, Johnston, Francis, Hardeman, & Eccles, 2008) but needs further work to realise the full potential for theoretical and technological advance in changing behaviour, and forms part of our research programme.

Conclusions: developing the science and technology of behaviour change

For both scientific and practical reasons, it is essential that behaviour change interventions develop a sounder scientific basis. In practice, the science will inform the technology (i.e. the techniques and methods) required to deliver effective replicable interventions with guidance on their delivery to ensure that effective interventions are actually used. For science, we have argued for clarity about 'behaviour' being the defined and measured outcome of interventions rather than other outcomes further back or further down the causal chain that leads to valued health outcomes. Recent progress in classifying the active components of behaviour change interventions, BCTs, has begun to produce the precision and specificity required to build cumulative evidence. Progress, however, will depend on linking active ingredients to an understanding of the processes involved, that is, to the theoretical basis of behaviour change. A science of behaviour change needs both good theory and reliable technology.

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